THE REFORM OF SALMON AND STEELHEAD HATCHERIES IN PUGET SOUND AND COASTAL WASHINGTON TO RECOVER NATURAL STOCKS WHILE PROVIDING FISHERIES

Gorton Science Advisory Team
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GOALS:

Goals of hatchery reform are to conserve indigenous genetic resources, assist with the recovery of naturally spawning populations, provide for sustainable fisheries, conduct scientific research, and improve the quality and cost-effectiveness of hatchery programs.

I. INTRODUCTION.

Approximately one hundred anadromous fish hatchery facilities currently exist in Puget Sound and Coastal Washington. These facilities produce more than one hundred million juvenile salmon and steelhead annually. The primary purposes of these facilities have been to produce fish for fisheries and compensate for declines in naturally spawning populations negatively impacted by land-use practices, water diversions, overfishing, and urbanization.

Hatcheries have had considerable success at producing harvestable fish, and in most instances, hatchery stocks provide the larger proportions of catches in sport, commercial, and tribal fisheries. To take advantage of harvestable hatchery fish and maintain some harvest on wild stocks, the State and Tribes developed a management system that included both wild and hatchery management regions. Fisheries on mixtures of wild and hatchery stocks were managed at levels for the weakest wild management unit. Terminal fisheries were designed to harvest higher proportions of hatchery fish. Variable ocean survival coupled with rapidly degrading habitat led to overestimates of harvestable adults, which resulted in overharvest of wild stocks. Thus, one of the problems which has depleted natural stocks derives from their interaction with hatchery fish in mixed stock fisheries. This overexploitation, together with environmental deterioration, has reduced the abundance of natural stocks of salmon and steelhead to the point where many populations are listed, or are proposed for listing, under the Endangered Species Act (ESA).

The artificial rearing environments of hatcheries can yield fish that differ behaviorally or biologically from their wild counterparts. As a consequence, these effects may reduce the survival or reproductive success of hatchery-origin fish, relative to wild fish, under natural conditions. A major unknown is whether hatchery-origin fish directly affect the survival or fitness of naturally spawning fish, either through direct interbreeding or indirectly through

ecological interactions. Future use of hatcheries as a fishery management tool will require close monitoring and evaluation of genetic and ecological interactions between hatchery and wild fish.

In addition to the historic role of hatcheries augmenting fisheries, the conservation role of salmon hatcheries is increasing in the Pacific Northwest. These conservation roles can take on many forms (e.g. traditional hatch, rear and release, or some form of captive propagation), but the one underlying principle that unites all such programs is the goal to minimize genetic changes between fish spawned in a hatchery and those spawning naturally.

The future role of hatcheries will depend upon their locations, rearing conditions, and other factors relating to their capabilities. Some hatchery programs will have multiple roles. Regional fishery plans, currently being developed by agencies and tribes, will address a broad range of issues including habitat, fisheries, and hatcheries that incorporate reform. However, timeliness is critical to salmon recovery, and important actions regarding hatchery reform can, and should, be started immediately. It is also imperative that harvest issues continue to be resolved to allow hatcheries to maintain their traditional role of producing fish for fisheries.

The basis for hatchery reform and retrofitting should be the best scientific information available, and scientific studies must be expanded as a means to adaptively manage the hatchery system. Budgetary costs will increase for accelerated scientific learning, but the costs will be small relative to other costs such as freshwater habitat rehabilitation. In addition, the time span for major results from hatchery reform will be shorter than those associated with habitat rehabilitation. There will also be costs to integrate conservation objectives with existing or new programs, either by conversion of existing facilities or new construction.

We believe there is no need for further debate regarding hatchery reform. Four recent independent scientific reviews of the hatchery system of the Columbia River are consistent in concluding the general nature of needed changes.[1] While none of these studies was directed toward Puget Sound and Coastal Washington, many of the problems are similar.

The purposes of this proposal are to initiate the development of guidelines for hatchery management, recommend actions which will use hatcheries to directly support fisheries, assist with the recovery of natural stocks, and minimize the potential negative effects of hatchery programs upon naturally spawning populations. Consideration should be given to using a few hatcheries for scientific research, although research in the form of monitoring and evaluation should be a part of all hatchery programs. This is a proposal to reform hatcheries and maintain fisheries by taking actions which are needed now.

II. RECOMMENDED ACTIONS TO ACHIEVE HATCHERY REFORM.

Recovering natural salmon stocks while simultaneously providing fisheries supported by hatchery programs requires the continuing implementation of knowledge gained from experimentation in the following areas.

A. Improve Hatchery Programs and Facilities.

Hatchery management programs need to incorporate recent advances in technology to protect genetic resources and improve survival of hatchery fish. These actions should:

1. Implement hatchery plans for each facility that include comprehensive goals, based on adult returns and an assessment of risks to natural stocks.

2. Prevent significant infusion of non-indigenous, non-adaptive genes into local natural stocks, and maintain indigenous genetic resources.

3. Discourage actions that result in selection for domestic traits of cultured fish in conservation programs.

4. Prevent loss of genetic diversity in hatchery stocks.

5. Avoid actions that result in detrimental ecological competition between natural and cultured fish.

6. Employ new rearing and release protocols demonstrated to improve survival of released fish and/or operational efficiencies of hatcheries.

7. Employ rearing and release protocols demonstrated to allow separation of natural and hatchery fish in fisheries and on spawning migrations.

8. Use hatcheries to assist with the recovery of naturally spawning populations when the biological benefits of artificial propagation are estimated to outweigh the risks.

Budgetary costs will be incurred to reform hatchery programs and retrofit facilities to achieve the objectives outlined above.

B. Evaluate and Monitor.

Advancements in hatchery technology and productivity have been stymied by the tendency to adhere to the false assumption that large numbers of juvenile hatchery salmon released into the wild will automatically result in high adult returns. Hatchery goals must be shifted from production of juvenile fish to quantifiable measures of adult salmon and steelhead added to appropriate fisheries, rebuilding of wild stocks, and other social values. Specific information needs include contribution of hatchery-origin fish to fisheries, incidental catch or harvests of wild fish, biological effects of time, location, or gear type in selecting for specific sizes or ages of fish in the fisheries, stray rates and locations of hatchery-origin fish, genetic contribution of hatchery-origin fish to naturally spawning populations, detail of releases from each hatchery, operational costs, positive and/or negative impacts on weak wild stocks, catches by fishery and an assessment of the net values resulting from the operation of the facility.

C. Conduct Scientific Experimentation.

Fertile areas for experimentation include testing methods to condition hatchery fish for survival in the wild, the genetic and phenotypic consequences of hatchery culture and potential domestication, reproductive success (genetic contribution) of hatchery and hatchery-wild crosses in the wild, ecological and genetic effects of hatchery fish on naturally spawning populations, factors affecting straying and homing of hatchery-origin fish, nutrition and growth management, improvements in fish health, optimizing rearing densities, stock selection for optimum efficiency, evaluation of appropriate brood stocks for wild stock supplementation, rearing techniques to target specific fisheries, and increasing our knowledge regarding the overall impacts of hatchery programs on wild stocks. Funds for experimentation seeking to increase the overall effectiveness of hatcheries have commonly been sacrificed in favor of maximizing quantities of fish released. Shifting to goals defined in measurable benefits will facilitate the evaluation and experimentation that is needed for increased efficiency and compatibility with wild stocks.

D. Identify Hatchery-Origin Fish.

Marking or tagging all hatchery-origin fish, or a major portion thereof, will allow convenient visual identification of hatchery and wild fish in fisheries and on natural spawning grounds, thus facilitating fisheries management and the monitoring of biological interactions between the two groups. If mixed stock fisheries are to be maintained in the near future, selective fisheries will have to be implemented.

E. Institute Adaptive Management.

Use of adaptive management is critically needed within the hatchery system. This requires scientific testing of hypotheses and incorporating new knowledge. The need to coordinate and implement existing and new information is essential for the success of salmon and steelhead hatcheries. Specific tasks and timetables have to be identified and funded. Structural changes within the hatcheries will be required to implement new strategies for rearing, separation of hatchery and wild fish, and to allow accessibility of hatchery juveniles for marking or tagging. Tracking hatchery reform and recovery of wild salmon and fisheries is essential for monitoring the progress toward planned objectives.

III. ORGANIZATIONAL STRUCTURE REQUIRED TO ACHIEVE HATCHERY GOALS.

A. Scientific Support and Training.

Sufficient staff with proper coordination, training, funding, and facilities, will be required to achieve the goals outlined above. We call special attention to the need for increased technical and scientific training. Additional staff and facilities for the agencies and tribes will be required. Experts will be needed for experimental design, carrying out and analyzing experiments, direct

technical support (e.g. in genetics, disease, nutrition, and physiology), and providing guidance to hatchery managers to adaptively manage the system.

B. Hatchery Scientific Review Group.

An important mechanism which needs to be established is a process for scientific review of hatchery operations. A need exists to establish a Hatchery Scientific Review Group (HSRG) to (a) produce guidelines and recommended actions for hatchery reform and (b) to ensure that the goals of hatchery reform are carried out. Success in this effort means that the hatchery management agencies concur with the recommended actions and implement changes. Accordingly, we believe the relevant agencies and tribes should have a significant role in the scientific review.

We propose that the HSRG consist of nine members with two components: five independent scientists who have no responsibility to the management agencies involved and four agency scientists with special, relevant skills. The geographical region we propose to encompass is the State of Washington exclusive of the Columbia River. Each of the fishery agencies operating hatcheries, or hatchery research facilities in this region (WDFW, TRIBES, NMFS, and USFWS), would select one qualified scientist to serve on the HSRG. These scientists would be responsible for evaluating scientific merits and would not represent agency policies. They would be required to have technical skills in relevant fields such as fish biology or fish genetics, and some understanding of agency hatchery processes; administrative status within the agency would not be relevant. The five independent scientists would be selected initially by the Gorton Advisory Team from a pool of nine candidates nominated by the American Fisheries Society (AFS). When one of the independent scientists steps down, a replacement member would be selected by the HSRG from among a pool of three nominees provided by the AFS. The chair of the HSRG would be one of the independent scientists and should have experience in dealing effectively with complex, highly controversial scientific issues. The HSRG would be compensated for time and travel. The HSRG would submit a written report annually to the agencies, tribes and Congress, evaluating progress toward meeting goals, with areas of disagreement clearly and evenly presented. The purpose of the HSRG is not to debate whether or not hatcheries have a role in salmon management; the goal is to make hatcheries fulfill their objectives while minimizing negative impacts on natural stocks.

C. Hatchery Management Coordination.

Many watersheds have multiple hatcheries run by different agencies and tribes. Hatchery operations must be coordinated within logical geographical management units. There is an ongoing process among the relevant agencies, driven by the urgency of ESA and need for stock recovery, to develop the needed management plans which include establishing the roles of hatcheries. It will be necessary for the relevant agencies to use existing coordinating mechanisms so that all hatcheries are managed consistent with these plans. Again, we do not suggest that the mechanisms we propose should interfere with this ongoing planning process, except that

progress should be reviewed in terms of adequacy, timeliness, and consistency with the goals and guidelines developed by the HSRG.

IV. IMMEDIATE ACTION ITEMS.

A. Hatchery Scientific Review Group.

The selection process for this group can be started prior to funding. When funding is obtained, they will work with the agencies to prioritize needs and decide what actions can be initiated based on existing knowledge and available resources. They will review hatchery management plans for scientific consistency with hatchery reform goals, identify scientific needs, and recommend further experimentation.

B. Analysis and Evaluation.

The independent scientists, agencies, and tribes need funding to establish a team of scientists to generate and maintain data bases that will grow as part of this effort, analyze existing data, determine and undertake needed experiments, purchase scientific equipment and develop technical support infrastructures, initiate changes to the hatcheries based on their findings, and establish a science-based decision making process. Because the system is interactive with the fisheries, the fishery impacts and benefits will be included in the analyses.

C. Changes in Hatchery Programs.

Hatchery management plans should be implemented to augment fisheries, protect genetic resources, avoid negative ecological interactions between wild and hatchery fish, promote recovery of naturally spawning populations, and employ new rearing protocols to improve survival and operational efficiencies.

D. Budget.

It is difficult to budget precisely for a science-based management system that is not yet designed. Conversely, budgeting initially for just a science-review/planning function to determine what ultimately are the funding requirements defeats the intent of acting as soon as possible. Accordingly, there should be funding so projects can be started as soon as the needs are determined.

Suggested Budget for FY2000

1. Hatchery Scientific Review Group (III.B, IV.A.)	$ 300,000
2. Agency scientists and assistants to support scientific decision process (III.B., C.)	$ 800,000
3. Improve hatchery practices (II.A.)	$ 1,500,000
4. Implement scientific research (II.B., C.)	$ 1,000,000
5. Begin retrofitting hatcheries (II.A.)	$ 5,000,000
TOTAL	**$ 8,600,000**

Gorton Science Advisory Team
Peter Bergman, Ph.D, Northwest Marine Technology
Lee Blankenship, Wash. Dept. Fish & Wildlife
Donald Campton, Ph.D, U.S. Fish & Wildlife Svc.
Frank Haw, Northwest Marine Technology
Conrad Mahnken, Ph.D, Nat. Marine Fish. Svc.
Steve Phelps, Wash. Dept. Fish & Wildlife
Terry Wright, NW Indian Fish. Comm.

[1]Northwest Power Planning Council's (NPPC) Independent Science Group, 1996; The National Research Council, 1996; the National Fish Hatchery Review Panel, 1994; and the Scientific Review Team of the NPPC's Artificial Production Review, 1998.